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Review of Research on Online Learning Environments in Higher Education

Young Hoan Cho[a], Hyoseon Choi[a*], Jiwon Shin[a], Him Chan Yu[a], Yoon Kang Kim[a], Jung Yeon Kim[a]

[a]*Department of Education, Seoul National University, Seoul, Korea*

Abstract

A growing number of studies have been carried out to understand learning and teaching activities in online learning environments (OLEs) and to design effective OLEs for meaningful learning in higher education. Although there were a small number of studies to provide research trends in educational technology in regards to research topics, methods, and researchers, more research is necessary to help educators to understand new trends and issues of OLEs in higher education. This study intends to provide an overview of practical and theoretical issues pertaining to OLEs by analysing literature recently published in peer-reviewed journals. The present study qualitatively analysed research questions and purposes to identify themes of OLEs in higher education. The OLE research topics were grouped into three major themes: (1) participants, (2) micro-level environments, and (3) macro-level environments. The findings are followed by discussion of an ecological approach as a new theoretical framework to guide future OLE research and practice.

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Keywords: Online learning environments, Distance learning, Higher Education, Ecological approach, Macro/Micro-level OLEs ;

1. Introduction

A growing number of higher education institutions recently encourage faculty to use online learning environments (OLEs) to support classroom activities or to overcome the limitations of face-to-face learning environments. In a flipped learning model, for instance, college students view a video clip of a lecture on the Internet before carrying out student-centered activities such as projects, inquiry-based learning, and collaborative problem

* Hyoseon Choi. Tel:3-3-3-4566.
E-mail address: goodluck@snu.ac.kr

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solving in a classroom. The multimedia resources in OLEs may help students to gain knowledge required for their classroom activities. Moreover, a growing number of universities like Massachusetts Institute of Technology and Carnegie Mellon University provide their course materials and lecture videos to people all over the world via the Internet. A number of people nowadays take massive open online courses (MOOCs) that are designed and implemented by well-known instructors and scholars at prestigious universities. These movements are based on the development of information and communication technologies including smart devices. The innovative practices in higher education require educational researchers to develop new conceptions and theoretical frameworks to explain emerging phenomena in OLEs. New terms like Web 2.0, MOOCs, and digital natives have been created in order to explain novel technologies, activities, and learners. In addition, distance education researchers have conducted research about guided didactic conversation, independence and autonomy, transactional distance, and interaction (Gunawardena & Mclsaac, 2004). More recently, some researchers have interests in social presence and sociocultural contexts in which online learning occurs as well as affordances of new technologies such as 3D virtual worlds and smart phones. Despite substantial research interest in new trends of online higher education, more attention should be paid to developing a comprehensive conceptual framework for integrating a variety of research topics about online learning and teaching. Cleveland-Innes and Garrison (2012) pointed out that "missing is the reconceptualising, restructuring, and reshaping of the teaching and learning transaction already a part of distance education (p. 223)." Although a number of higher education institutions have adopted blended and online learning with new technologies, there are few studies about a model of OLEs in higher education. Cleveland-Innes and Garrison suggested new principles of teaching, which incorporates online learning as part of higher education, along with effective ways to promote the transition to the new learning and instruction. Particularly, they emphasized the need for professional development and support for the change of faculty roles in online higher education. However, the new principles of teaching have a limitation in addressing issues of sociocultural contexts, open educational resources, quality assurance, and individual differences that are essential for an adaptive OLE. It is necessary to conceptualize online learning and teaching more broadly based on an ecological perspective. Gibson (1993) argued that educators should pay attention not only online learning but also the interaction between individuals and their multiple environments. The environments may consist of multiple structures, each of which is contained in the other structure (Bronfenbrenner, 1997). According to the ecological perspective, it is necessary to understand diverse factors in OLEs that influence human behaviour beyond an immediate situation. In an online course, for instance, learners directly interact with a teacher, classmates, and learning resources via the Internet. Their interaction patterns may vary not only depending on the characteristics of online course components but also such macro-level environment as culture, national policies, and history of distance education. Yang, Olesova, and Richardson (2010) found that cultural backgrounds influenced communication styles in asynchronous online discussions in two universities. Thus, the ecological perspective can be helpful for synthesizing various components of OLEs and explaining online learning activities from multiple aspects. The current study aims to explore a conceptual framework of OLEs by reviewing recently published literature about online higher education. In order to gain new insight about this research area, this study adopted a bottom-up approach in which multiple researchers constantly analyzed and grouped research topics until they agreed with each other about themes emerging from the data. In addition, the ecological perspective was considered when categories are organized and compared with each other. The model developed in this research may well reflect the current trends and issues about OLEs in higher education.

2. Methods

The search for relevant literature involved a following process. In the first stage, the researchers discussed about keywords in order to search for studies closely related to the purpose of this study. As a result, keywords were set as follows: "e-learning," "online learning," "distance learning," "online course," "web-based learning," "open university," "cyber university," "virtual university," "distance university," "asynchronous," "synchronous." With the keywords, the researchers searched for articles in the electronic database, Web of Science. In order to identify the most recent research topics about online higher education, the researchers selected peer-reviewed journal articles and conference papers published in 2013. Although initially 278 articles were retrieved from the database, 77 articles which were seldom related to the research purpose were excluded from further analysis.

Two researchers created open codes for the selected articles (n = 201) by mainly examining research questions, purposes, and abstracts. It was possible to make multiple open codes for a single article. Through constant comparison and discussion, the researchers aggregated similar codes into a few categories, which were in turn grouped into themes (Creswell, 2012). The relationships between categories or themes were constantly discussed, which led to 16 categories and 3 themes.

3. Findings and Discussion

Through the analysis of selected studies, 16 research topics were identified, and they were grouped into three themes of OLEs: participants, micro-level environments, and macro-level environments. In this framework of OLEs, participants are involved within micro-level environments, which are in turn contained within macro-level environments (see Figure 1). The participant theme indicates characteristics of learners and instructors, which determine the interaction patterns in OLEs. This theme included five categories of research topics: demographic, cognitive, affective, intrapersonal, and interpersonal (see Table 1). Micro-level environments refer to the online course in which learners interact with peers, an instructor, and learning contents or resources. This theme includes five research topics: content, technology, instructional model & strategy, peer interaction, and assessment. Lastly, macro-level environments refer to the systems that influence online learning processes and outcomes beyond individual courses, including policies, sociocultural factors, and technological innovations. This study identified six topics of the macro-level environments: theory & perspectives, IT infrastructure & diffusion, administration, professional development, open educational resources, and communities.

Table 1. Research topics of OLEs in higher education

Level	Category	Description	Frequency
1. Participant (112)	1.1 Demographic	- Demographic information like gender, age, race, and education levels	24
	1.2. Cognitive	- Cognitive competencies like attention, intelligence, literacy, critical thinking, and belief	24
	1.3. Affective	- Affective characteristics like motivation, self-efficacy, attitude, and personal traits	43
	1.4. Intrapersonal	- Intrapersonal competencies like reflective thinking, metacognition, and self-regulation skills	19
	1.5. Interpersonal	- Interpersonal competencies like cultural awareness, collaboration skills, and leadership	2
2. Micro-level Environment (226)	2.1. Content	- Learning contents, tasks, and problems	20
	2.2. Technology	- Technologies to facilitate online learning and teaching	52
	2.3. Instructional Model & Strategy	- Instructional methods and strategies like blended learning, collaborative learning, and problem-based learning	85
	2.4. Peer Interaction	- Synchronous and asynchronous Interaction between learners	61
	2.5. Assessment	- Assessment of online learning processes and outcomes	22
3. Macro-level Environment (110)	3.1. Theory & Perspective	- Theories, models, and perspectives about learning and teaching; vision of online higher education institutions	34
	3.2. IT infra & Diffusion	- IT infrastructure and learning management systems; technological innovation and diffusion	24
	3.3. Administration	- Laws and policies for quality assurance; institutional efforts to support online learning and reduce drop-out rates	12
	3.4. Professional Development	- Faculty education and professional development for effective online learning and teaching in higher education institutions	13
	3.5. Open Educational Resources (OER)	- Open educational resources and massive open online courses that allow open access to higher education programs	17
	3.6. Community	- A variety of communities in which learners are involved; historical and sociocultural aspects of a community	9

3.1. Participants

This study identified a variety of topics about characteristics of learners and teachers in OLEs. Particularly,

affective aspects of online learners were often highlighted, including online learning self-efficacy and attitudes toward new technologies and online learning practice. For example, Shen, Cho, Tsai, and Marra (2013) identified five dimensions of online learning self-efficacy pertaining to online course completion, social interaction, use of a course management system, interaction with instructors, and peer interaction for online learning. They also revealed that demographic variables influence online learning self-efficacy and how it influences online learning satisfaction. The research of participants in online higher education is necessary to understand the actions of learners in OLEs and design an adaptive online learning system for learners with different knowledge, skills, and values. Despite substantial research on participants in OLEs, little attention is paid to characteristics of higher education learners, which are different from those of k-12 students. Adult learners in higher education are likely to have diverse background knowledge and professional experiences. They also have more advanced epistemological beliefs (Kuhn, Cheney, & Weinstock, 2000) and self-regulated learning skills when compared to primary and secondary school students. These characteristics of adult learners may be closely related to the rapid development of open education resources, MOOCs, and online learning communities, which require learners to self-regulate their learning progress and actively interact with other community members. Future research is recommended to investigate spontaneous seamless learning of adult learners in formal and informal higher education.

3.2. Micro-level Environments

In micro-level environments, one of the most favored topics is technology to support online learning and teaching. The high interest of state-of-the-art tools and devices is not surprising because they can provide new learning and teaching opportunities that were not available in the past. For example, Chaiprasurt and Esichaikul (2013) found that learners supported with mobile communication tools were more engaged in online learning and gained more achievements than those who did not use the tools. In addition to the research of new technologies, a number of researchers have investigated instructional strategies to facilitate online learning activities. Based on the Community of Inquiry framework, Stein et al. (2013) explored the benefits of a coaching and feedback strategy for higher-order thinking in online chats. These studies can significantly contribute to the improvement of online learning processes and outcomes, which largely depend on the interaction between participants and a micro-level environment. Nevertheless, few studies have investigated the relationships among the components of a micro-level environment such as contents, instructional strategies, and technology. If there are contradictions among online learning components, learners will not be able to achieve desired learning outcomes. It is necessary to investigate what learning tasks and instructional strategies can optimize the use of new technology like smart devices. In addition, micro-level environments are closely connected to both participants and macro-level environments (see Figure 1). The micro-level environment should be adaptive to the needs and interests of learners and consistent with the rules and customs of a society. The contradictions between different levels may lead to unproductive learning in OLEs as the contradictions within each level. For instance, student-centered instructional models (e.g., problem-based learning) may not be effective in a situation where learners prefer direct instruction and lack constructive learning experience; assessment requires merely lower-order thinking; and the degree of power distance is large between learners and an instructor. Future research is necessary to explore how to design and redesign a micro-level environment based on the complex relationships and contradictions in OLEs.

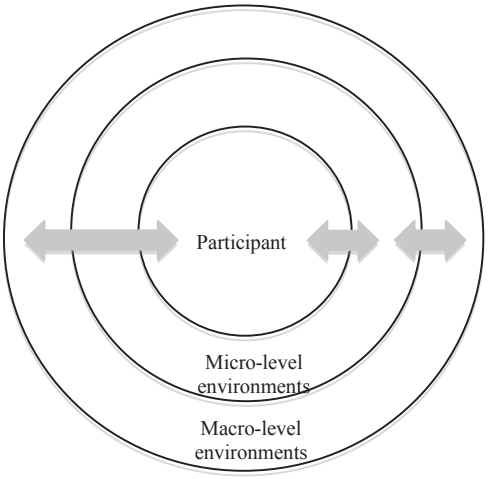

Figure 1. OLEs in higher education

3.3. Macro-level Environments

Recently, a growing number of studies address research issues in macro-level environments. Although diverse research topics were found in regard to macro-level environments, studies of open educational resources and MOOCs were recently highlighted. For example, Khanna and Basak (2013) described an architecture framework of open educational resources architecture framework in terms of six key dimensions: academic, pedagogical, technological, financial, managerial, and ethical. In addition, a number of studies investigated professional development and faculty education, which are essential for restructuring and reshaping instructional practices in OLEs. In higher education, instructors usually have high subject matter knowledge in their research areas, but they may not have sufficient knowledge and experience of online learning and teaching. Esterhuizen, Blignaut, & Ellis (2013) developed a model of faculty development for the integration of socially transformative technology in OLEs. In addition to the research trends in macro-level environments, the current study found that research topics about online higher education varied depending on historical and sociocultural contexts of countries in which the research was carried out. In countries with a shorter history of open and distance education, research was more likely to focus on how learners and instructors perceive online learning and what determines the adoption of innovative pedagogy with new technology. On the other hand, research in countries with a tradition of well-established distance education was more likely to address emerging issues of higher online education such as open education resources and institutional collaboration. It is plausible that macro-level environments influence not only online practices in higher education but also research topics that reflect the needs of a society.

4. Conclusion

In the ecological perspective, individual learners as social beings constantly interact with micro- and macro-level environments, which are closely associated with each other. Recently, research of OLEs in higher education has investigated not only participants and micro-level environments but also macro-level environments including diverse sociocultural issues beyond a single course. The activities of learners within micro- and macro-level environments lead to not only the development of individuals' knowledge, skills, and values but also the change of OLEs. For instance, the development of learners' epistemological beliefs allows an instructor to design and implement more student-centered activities in online higher education. To develop a comprehensive understanding of OLEs, it is necessary to investigate reciprocal and dynamic relationships of OLE components between different levels as well as within each level.

In addition, the current study found that a variety of research topics about OLEs, which are based on multiple disciplines. Traditionally, educational psychology has paid more attention to minds of learners and instructors, whereas educational technology and learning sciences studies are more interested in the design of micro-level environments including learning tasks, instructional strategies, and technology. In addition, issues in macro-level environments have been often discussed in the areas of educational policy, lifelong education, anthropology, and comparative education. Thus, multidisciplinary collaboration is highly recommended to develop a comprehensive conceptual framework of OLEs in higher education.

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